FISHER'S *THE PURCHASING POWER OF MONEY.**

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The Purchasing Power of Money is a notable achievement. In this work, Professor Irving Fisher defines and elucidates the concepts at the basis of money theory in a particularly clear and interesting manner; he builds up and states the equation of exchange, $MV+M'V'=PT$,† so that there can be neither misconception as to its meaning, nor, as it seems to the reviewer, doubt as to its truth; he justifies the "quantity theory" by showing that prices are the dependent variables, that changes in the quantity of money in circulation, M, cause proportionate changes in the volume of bank deposits, M', and that the other items in the equation of exchange, *i. e.*, the velocities of circulation of money and checks, V and V', and the volume of trade, T, are independent variables; he breaks new ground in his thorough discussion of the measurement of the velocity of circulation of money and checks; he gives an excellent summary of the literature on index numbers together with a mathematical treatment of index numbers; he makes careful estimates of the right and left-hand sides of the equation $\frac{MV+M'V'}{T}=P$ for the years 1896–1910, inclusive, and finds a striking agreement of the values; he analyzes the causes of price change during the period in question and concludes "that the growth of money was the largest factor" in raising prices (p. 311); finally, he discusses Gresham's law, bimetallism, the history of prices, and the problem of making purchasing power more stable.

The fundamental concepts which Professor Fisher defines in *The Purchasing Power of Money* were previously defined in

* *The Purchasing Power of Money. Its Determination and Relation to Credit, Interest and Crises.* By Irving Fisher, assisted by Harry G. Brown. New York: The Macmillan Co., 1911, pp. xxii, 505, $3.00 net.

† M = money in circulation.
V = velocity of circulation of money.
M' = bank deposits subject to check (deposit currency).
V' = velocity of circulation of deposit currency.
P = general price level.
T = volume of trade.

his *Nature of Capital and Income.* For instance, the *value* of any item of wealth is defined to be "its price multiplied by its quantity" (p. 3). Critics have questioned, and, probably, will question the usefulness or legitimacy of this and other definitions.* However, Professor Fisher's argument in the present case is not invalidated by the nature of the fundamental concepts which he uses. For example, consider the following sentence from *The Purchasing Power of Money* (p. 100) in connection with the definition of value above quoted: "Wherever the estimated cost of producing a dollar of gold is less than *the existing value of* a dollar in gold, it will normally be produced." The words which the reviewer has placed in italics are, indeed, redundant if we hold Professor Fisher to his definition of value, but the statement which he makes is not thereby invalidated.

The algebraic statement of the equation of exchange is, as Professor Fisher says, "a good safeguard against loose reasoning" (p. 24). That it clarifies the points at issue between the opponents and supporters of the quantity theory was shown in the discussion on "Money and Prices" in the last (December, 1910) annual meeting of the American Economic Association. The opponents of the quantity theory accepted the equation of exchange which Professor Fisher presented as a "mathematical identity" and as "a statement of the problem of price levels." † The points at issue between the supporters and the opponents of the quantity theory in the discussion referred to reduced themselves to the question, Is the variation in the price level, P, the cause or the effect of the variation of the amount of money in circulation, M, the amount of deposit currency, M', and their velocities, V and V'? ‡ The definition of the points at issue and the greater agreement

* For instance, A. A. Young has questioned the legitimacy of imputing a value to a whole stock of goods on the basis of the prices paid for the thin rivulet of goods which trickles through the market. (See "Some Limitations of the Value Concept" in the *Quarterly Journal of Economics*, May, 1911.)

† *Bulletin of the American Economic Association*, April, 1911, remarks by R. R. Hess and J. L. Laughlin, pp. 66, 67.

‡ Professor H. L. Moore apparently holds that this question is impossible of answer. In his recently published *Laws of Wages*, p. 2, he says: "Economic events are not arrayed in linear connection, the one following the other in direct series, as was frequently assumed by the classical economist. It was an idle controversy that Malthus and Ricardo conducted upon the question whether the abundance of food increases the population or the multitude of consumers increases the supply of food. Social phenomena are interrelated, are mutually dependent. . . . "

evidenced regarding the theory of prices * are undoubtedly to be ascribed to the statement of the equation of exchange in mathematical terms.

One of the important steps in Professor Fisher's argument to show that P is the "puppet " of the other items appearing in the equation is to demonstrate that the deposit currency, $M,'$ bears a more or less definite ratio to the money in circulation, M. Professor Laughlin holds that Professor Fisher is in error "in supposing that a man's deposit account at any time varies with the amount of money in his possession."† *The Purchasing Power of Money* contains no supposition that variations in a man's deposit account are caused by similar variations in his pocket money. Professor Fisher bases his contention "that the quantity of circulating credit, $M,'$ tends to hold a definite relation to M, the quantity of money in circulation," upon two facts, *i. e.*, first, "that bank reserves are kept in a more or less definite ratio to bank deposits " because experience has shown that a certain percentage is necessary to enable a bank to pay its debts *on demand* and, second, "that individuals, firms, and corporations preserve more or less definite ratios between their cash transactions and their check transactions, and also between their money and deposit balances " (p. 50). In a later chapter (p. 55) he shows that the relation between M and M' is not a rigid one. For instance, during a transition period in which M is increasing "M' increases still faster, thus disturbing the normal ratio between these two forms of currency " (p. 61). The rising prices, Professor Fisher argues, which must necessarily result from an increase of M, if the equation of exchange is true, will stimulate trade, P, by the temporarily easy terms for loans (p. 61) and will accelerate the circulation of money and deposit currency, V and V' (p. 63). The entire argument is convincing. However, it is not clear just what amount of economic disturbance is necessary to make a "transition period." Are we always in the midst of one?

Professor Fisher gives an interesting discussion of the indirect influences which operate upon prices through the five

* *Bulletin of the American Economic Association*, April, 1911, remarks by J. L. Laughlin, p. 28, and J. F. Johnson, p. 59.

† *Ibid.*, p. 68.

items of the equation of exchange. Among such indirect influences are the division of labor, the accumulation of capital, the extent and variety of human wants, the character of the monetary and banking systems, and business confidence, all of which influence prices through their effect on a volume of trade, T. Various causes, such as the use of checks, the system of payments used by the community, and density of population affect prices through the velocities of exchange, V and V'. The system of banking and the extent of utilization of that system and the use of charge accounts affect prices through the volume of deposits, M'. The chief influences operating upon prices through the money in circulation are: the exportation and importation of money, the melting or minting of money, the production and consumption of money metals and the monetary and banking systems. In regard to the tariff Professor Fisher concludes, "The tariff wall is a sort of dam, causing an elevation in the prices of the goods impounded behind it. . . . It furnishes a temporary stimulus, not only to protected industries, but to trade in general, which is really simply the stimulus of money inflation" (pp. 94, 95).

The general conclusion to be drawn from the argument in *The Purchasing Power of Money* is succinctly stated by Professor Fisher as follows: "The quantity theory is true in the sense that one of *the normal effects of an increase in the quantity of money is an exactly proportional increase in the general level of prices.* To deny this conclusion, requires a denial of one or more of the following premises upon which it rests:

(1) The equation of exchange, $MV+M'V'=\Sigma pQ$.

(2) An increase of M normally causes a proportional increase of M'.

(3) An increase of M does not normally affect V, V' or the $Q's$" (pp. 157–158).

If we accept the equation of exchange, $MV+M'V'=PT$, as being true—as was done by the opponents of the quantity theory in the discussion on "Money and Prices"—and if we accept Professor Fisher's contention that "*the price level is normally the one absolutely passive element in the equation of exchange*" (p. 172)—which is contested by the opponents of

the quantity theory—then we are compelled to accept a further conclusion stated by Professor Fisher. It is, that the causation of the *price level* is entirely distinct from the causation of the *price of any individual commodity* (p. 175 *et seq.*). It is best to use Professor Fisher's own words in stating his argument: "The legitimacy of separating the study of price level from that of prices will be clearly recognized, when it is seen that individual prices cannot be fully determined by supply and demand, money cost of production, etc., without surreptitiously introducing the price level itself (p. 175). . . . The significance of a dollar lies in what it will buy; and the equivalence between sugar and dollars is at bottom an equivalence between sugar and *what dollars will buy.* A change in the amount of what dollars will buy is as important as a change in the amount of sugar. The price of sugar depends partly on sugar and partly on dollars,—that is, on what dollars will buy —that is, on the price level. Therefore, beneath the price of sugar in particular there lies, as one of the bases of that particular price, the general level of prices (p. 177). . . . The reactionary effect of the price of one commodity on the prices of other commodities must not be lost sight of " (p. 179).

Professor Kemmerer, who accepts the quantity theory, and Professor Laughlin, who rejects it, both maintain that the distinction drawn by Professor Fisher between the prices of individual commodities and the general level of prices is untenable. The former "can conceive of no such distinction between the general price level and individual prices." * The latter says that Professor Fisher "wrongly works from a general level of prices to particular prices; while I hold that particular prices, or actual quotations, are the bases from which all averages, or price levels, are always and inevitably computed. Moreover, in his [Professor Fisher's] diagrams, the level of prices he used was the one computed from individual quotations. Hence, his whole reasoning on the conformity of the statistics to the terms of his equation is vitiated." † It is true that Professor Fisher computed P as an average of individual prices, based mainly upon the Bureau of Labor

* *Bulletin of the American Economic Association*, April, 1911, p. 53.
† *Ibid.*, p. 69.

index numbers of wholesale prices. But P was also computed from the function $\frac{MV+M'V'}{T}$ without use of the prices of individual commodities. The two sets of values thus obtained for P were compared as a "statistical verification" of the equation of exchange. Professor Fisher does not argue that the relative price level does not show itself in the prices of individual commodities but quite the contrary. The reviewer understands Professor Fisher's conception to be as follows: There are two streams, one of money and money substitutes, the other of commodities, which are equated in the market. On the one hand, the stream of money and its substitutes is only slightly flexible, since a given community has fixed financial habits and a certain banking development. On the other hand, the stream of commodities passing from sellers to buyers is determined by other than money influences. It is the equating of these two relatively inflexible streams that determines the price level. Hence, "the price level is not determined by individual prices, but, on the contrary, any individual price presupposes a price level" (p. 180). *

Professor Fisher's discussion of "The Best Index Numbers of Purchasing Power" (Chapter X and Appendix) is both lucid and comprehensive. This portion of *The Purchasing Power of Money* together with the "Statistical Verification" (Chapters XI and XII) are, perhaps, the most interesting parts of the book to statisticians. The relegation of the more technical and mathematical parts of the discussion to the Appendix makes the matter available to all classes of readers. The problem considered is to get the best forms of index num-

*In regard to the point at issue between Professors Laughlin and Kemmerer and himself, Professor Fisher states in a letter to the reviewer: "There seems to be in the mind of Laughlin, and perhaps of Kemmerer, a confusion between two senses of the word 'determination.' Of course it is true that the best statistical determination of the price level is to be obtained directly from the individual prices, but this does not mean that the price level has been *causally* determined by the individual prices. The determination of the price level and the determination of our knowledge of what the price level is are, of course, totally distinct, just as the determination of a level of the sea and the determination of our knowledge of what it is. We would apply the word 'determination' in each case, though the meanings are totally distinct. We determine the level of the sea at any time by averaging the positions where the waves beat upon the shore, taking account of the fluctuations between the receding and incoming waves or ripples. But no one, except in a joke, would accuse the engineers, who thus elaborately try to 'determine' the level of the sea, of inconsistency when they also state that the level of the sea is determined by the attractions of the moon, etc. A Laughlin in astronomy might say that the level of the sea is determined not by the moon, but by the individual drops of water splashing on the shore; and that even those admit this who believe the moon theory when they come to actually determining the level of the sea!"

bers for general prices, P, and the volume of trade, T. "Each form of price index, P applicable to the equation of exchange, implies a correlative trade index, T, such that the product of the two is equal to ΣpQ, the right side of the equation of exchange.

$$\text{Since } PT = \Sigma pQ$$

$$\text{it follows that } T = \frac{\Sigma pQ''}{P} \text{ (p. 385).}$$

Professor Fisher examines in detail forty-four different varieties of averages of index numbers of prices, including all the familiar forms, together with the correlative trade indices (p. 400 *et seq.*). After subjecting each variety of average to eight tests and finding that "no form of index number P, conforms perfectly to all the eight tests when a common base year is employed" he concludes that the best formula for P is $\frac{\Sigma p_1 Q_1}{\Sigma p_0 Q_1}$ * (p. 429). He chooses, then, "As one of the best index numbers of prices, the average price of the goods sold, those goods being measured in units worth a dollar in a base year; in other words, the ratio of a value of sales at actual prices to the value of the same sales if made at base prices; in still other words, the weighted arithmetical average of all price ratios, each ratio being weighted according to the value sold, reckoned at base prices" (p. 203). Practical considerations, however, led Professor Fisher to agree with Professor Edgeworth in recommending the median with its two neighboring quartiles "with a simple system of weights (whole numbers) based on expenditures, and changing from time to time for the sake of making better year-to-year comparisons" (p. 429). The disadvantages in having a base year remote from the years being compared caused Professor Fisher to recommend a variable base; the best base for any year is the previous year (p. 203). All of these recommendations are well advised. Professor Fisher comes to the additional conclusion that "the best index number for the purpose of a standard of deferred payments in business is the same index number

* The notation is as follows:
p_1 = price of any commodity in any year.
Q_1 = quantity of such commodity exchanged in such year.
P_0 = price of any commodity in the base year.

which we found it best to indicate the changes in prices of all business done" (p. 225).

After giving an historical summary of the statistics of money and prices beginning with the thirteenth century, Professor Fisher makes careful estimates of the items appearing in the equation of exchange for the years 1896–1910. It is only for this period that data are available for a reliable estimate of the amount of deposit currency, M', and its rapidity of circulation, V'. The five magnitudes in the equation of exchange are found as follows:

M, the amount of money in circulation in the United States, is found by subtracting "the money in the federal treasury and the estimate of money in banks reporting and unreporting" from the official estimate of money in the Unites States "corrected by means of recent revisions of the estimates of gold in the United States."

M', individual deposits subject to check, is found by adding to "individual deposits," as reported by the Comptroller of the Currency, the estimated unreported deposits and subtracting "deposits of trust companies and savings banks in national banks," "deposits in savings banks," and "exchanges for clearing house." The percentage of the remainder thus obtained that is subject to check is estimated from figures furnished by the Comptroller of the Currency and the National Monetary Commission.

$M'V'$ is estimated from Professor Kinley's figures giving the value of checks deposited on "the settling day nearest July 1, 1896," and on March 16, 1909, allowance being made for the exceptional character of the deposits on these days as evidenced by New York clearings. For the two years 1896 and 1909, the values of $M'V'$ were found to be 97 and 364 billions, respectively. The values of $M'V'$ for the intervening years are interpolated by using as a barometer New York clearings plus five times outside clearings.

V' is found by dividing $M'V'$ by M' for the corresponding year. This value varies from 36 in 1896 to 54 in 1909 with maxima in 1899 and 1906.

MV. Professor Fisher has achieved a triumph in ascertaining values, which appear to be exceedingly accurate, for the

total of money exchanges, MV, and the velocity of circulation of money, V. He shows that a coin or bill does not circulate indefinitely. After circulating a very few times, usually twice, each piece of money returns to a bank. When money is paid to a wage-earner (usually, a non-depositor) almost invariably it is given to a commercial depositor in exchange for goods, the latter depositing the money in some bank. Thus two exchanges, and two only, are effected by money paid to wage-earners. On the other hand, money paid to members of the professional and commercial classes (who are almost universally depositors) finds its way into a bank immediately, and hence is exchanged for goods or services but once. Consequently, if we take all the money deposited in banks (for which we have estimates for 1896 and 1909), add to it the expenditures of non-depositors (which can be estimated from the amount paid wage-earners, certain clerks, and farmers) and add to the sum a corrective factor for intra-class exchanges and other minor items we will obtain the total of exchanges effected with money, MV. The values for 1896 and 1909 are 16 and 35 billions, respectively, the corrective factor being about one billion in each case. Professor Fisher concludes, therefore, "that *money deposits plus wages, divided by money in circulation*, will always afford a good barometer of the velocity of circulation" (p. 476).

V is found to be 19 and 22 for 1896 and 1909, respectively. These results are obtained by dividing MV by M as found above. Values for intervening years are interpolated.

T, the volume of trade, is "constructed by averaging index numbers of the *quantities* (not the values) of trade in various lines. The figures are based on data for forty-four articles of internal commerce and twenty-five of export, sales of stock, railroad freight carried, and letters through the post office" (p. 291).

The preceding data are sufficient for the estimation of the relative general price level, $\frac{MV+M'V'}{T}$, with no reference to the prices of individual commodities. However, as a check to the accuracy of his previous estimates, Professor Fisher

estimates P directly. For this purpose he computes a weighted average of the Bureau of Labor index numbers of wholesale prices, Bureau of Labor index numbers of wages, and W. C. Mitchell's index numbers of the prices of forty stocks, with weights of 30, 1, and 3, respectively. Thus, there are two series of values for the "statistical verification" of the equation of exchange. They are as follows:

INDEX NUMBERS OF PRICES AS CALCULATED.

(*The Purchasing Power of Money*, p. 293.)

	Directly. (P)	Indirectly. $\left(\frac{MV+M'V'}{T}\right)$		Directly. (P)	Indirectly. $\left(\frac{MV+M'V'}{T}\right)$
1896	63	54	1904	85	81
1897	64	52	1905	91	83
1898	66	56	1906	97	90
1899	74	69	1907	97	86
1900	80	68	1908	92	87
1901	84	76	1909	100	100
1902	89	82	1910	104	105
1903	87	75			

The agreement between the two series is remarkably close. The "correlation coefficient" is 0.98. But, as Professor Fisher says, the correlation coefficient, computed in the usual way, does not measure the extent of correspondence of the year-to-year or minor fluctuations. If, instead of correlating the two series in the ordinary way, we compute the correlation coefficient for the *differences* or *ratios* between successive values of the two variables we obtain a measure of the correspondence of year-to-year fluctuations.* The reviewer has found the correlation coefficient computed by the method of *differences* for the period 1896–1910 to be 62 per cent. of perfect. Professor Fisher finds the coefficient of correlation between the year-to-year *ratios* for the years 1896–1909 to be 57 per cent., a figure indicating a moderately high degree of

* For an explanation of the method of differences which was suggested by Mr. R. H. Hooker, see the article by W. M. Persons on "The Correlation of Economic Statistics" in *The Quarterly Publications of the American Statistical Association*, December, 1910, p. 307.

correlation.* The correlation coefficient (0.98) for the original series is much greater than the coefficient (0.62) for the *differences* between successive values. The reason for this is to be found in the systematic increase of both sides of the equation for the period in question, 1896–1910.

Professor E. W. Kemmerer has made the only estimates which are directly comparable with those made by Professor Fisher.† The estimates by the former cover the period 1879–1908. Using the period common to both investigations, 1896–1908, Professor Fisher finds that by the method of year-to-year ratios "the coefficient for my figures is 54 per cent. (or .54±.11) as against 37 per cent. (or .37±.14) for Kemmerer's" (p. 295). The reviewer finds the correlation coefficient by the method of the year-to-year ratios for Kemmerer's figures for the period 1879–1895 to be 59 per cent. Kemmerer's figures thus give a higher coefficient between the year-to-year fluctuations of the two sides of the equation of exchange for the period 1879–1895 than do Professor Fisher's figures for the period 1896–1909. The reviewer finds that the ordinary correlation coefficient (which measures the correspondence between the whole values and not the differences) for Kemmerer's figures, 1879–1895, to be 0.55 as compared with Fisher's coefficient of 0.97 for the period 1896–1909. The period 1879–1901 only was covered in the first edition of Kemmerer's *Money and Prices*. The ordinary correlation coefficient for this period is 0.23, indicating no correlation between the two series of values. However, the ordinary correlation coefficient for the period covered in the second edition of Kemmerer's book, 1879–1908, is 0.48, indicating some degree of correlation. The coefficient of correlation between the year-to-year ratios of Kemmerer's figures for the period 1879–1908 is 0.52, which indicates that about the same correspondence between the fluctuations of Kemmerer's fig-

* It may be instructive to compare the correlation coefficient between the year-to-year price differences computed directly and indirectly (0.62) and the correlation coefficient computed for the year-to-year differences of corn production in the United States and the average farm price on December 1st of each year. The latter coefficient is, of course, negative, since it measures the amount of correspondence between production and price. It has been found by the reviewer for the period 1866–1906 to be −0.83. ("The Correlation of Economic Statistics," p. 314.)

† Kemmerer, Money and Credit Instruments in their Relation to General Prices. New York (Holt), 2d Ed., 1909.

ures exists as that (*i. e.*, 0.54) existing between Fisher's series for the shorter period, 1896–1908. The various correlation coefficients found for the year-to-year ratios show that the correspondence between Kemmerer's series is approximately the same as between Fisher's series except for the '90s, not entirely covered by Fisher. Inverse fluctuation of Kemmerer's year-to-year ratios occur in 1890, 1891, 1893, 1895, 1899, 1901, 1902, 1903 and 1907. Inverse fluctuations of Fisher's year-to-year ratios occur in 1898, 1900, 1904, and 1905. It is noticeable that Kemmerer's figures, but not Fisher's, include the years of falling prices in the '90s. Considering Kemmerer's and Fisher's results together, then, there is a correspondence between the year-to-year fluctuations of the two sides of the equation of exchange of from 40 to 60 per cent. of perfect; Kemmerer's figures for the period 1879–1901 indicate that the correspondence between the whole values of the two sides of the equation of exchange is small; Fisher's figures for the period 1896–1910 on the contrary show a close correspondence of the whole values.

Professor Fisher does well to emphasize the importance of securing a more stable unit of purchasing power than we have at present in the gold dollar. His proposal of the adoption of the gold-exchange standard combined with a tabular standard looks feasible. It should receive attention.

The nature of the matter presented in *The Purchasing Power of Money*, the lucid explanations, the careful proof-reading, and the relegation of the more technical discussions to the appendices fit the book for use as a college text. In the opinion of the reviewer Professor Fisher's book takes its rank as the premier treatise on the theory of money.